

PATENT ABSTRACTS OF JAPAN

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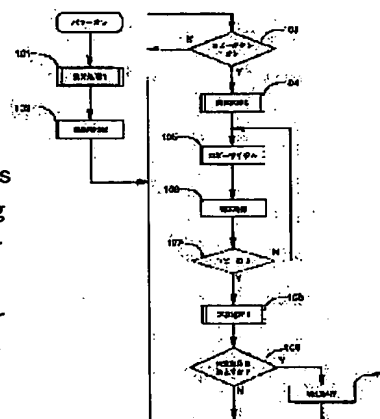
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(54) IMAGE FORMING DEVICE

(57)Abstract:

PURPOSE: To provide an image forming device which accurately predicts a time when the next toner replenishment is required.

CONSTITUTION: A toner use rate per sheet of recording material is obtained from the amount of toner consumed in one copying operation found by a dot counter in the previous copying and the cumulative sheet number of copies since the previous toner replenishment found by the counter of a controller. The amount of remaining toner is found from the toner use rate, the cumulative number of copies, and toner capacity. Further, the number of days which have been elapsed since the previous toner replenishment is found, and based on each information, the copyable number of copies and copyable number of days until the toner runs out are obtained. After a power source is turned on, these arithmetic processing 1 are performed again (101), the ordinary copying operation is repeated (102-107), then, the above arithmetic processing 1 is performed for this copying operation (108) and, when the result satisfies such conditions that the amount of remaining toner is not more than a specific amount (109), an informing process, as a warning to a display means, is performed (110).



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CLAIMS

[Claim(s)]

[Claim 1] In the image formation equipment which make a photo conductor front face expose based on image information, and form an electrostatic latent image, and develop this electrostatic latent image with the toner of a developer, and you make an image form, you make it record material imprinted and established, and is discharged An operation means to calculate the amount of the toner used based on each image information, and the means which carries out counting of the accumulation record material number of sheets from the last toner supply stage, the record material from the above-mentioned amount of the toner used, and accumulation record material number of sheets — the image formation equipment which has a means to calculate a toner residue based on a means to calculate the toner activity ratio per sheet, and this toner activity ratio and the above-mentioned accumulation record material number of sheets, and a means to urge toner supply based on this toner residue.

[Claim 2] The means to which toner supply is urged is image formation equipment according to claim 1 to which it is supposed that it has a display means to perform an alarm display.

[Claim 3] The means to which toner supply is urged is image formation equipment according to claim 1 to which it is supposed that it has the means of communications which communicates.

[Claim 4] The means to which toner supply is urged is image formation equipment according to claim 2 or 3 to which it is supposed that toner supply is urged when a toner residue becomes less than the specified quantity.

[Claim 5] The means to which is equipped with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, and toner supply is urged is image formation equipment according to claim 2 or 3 to which it is supposed that toner supply is urged when this record material number of sheets becomes less than predetermined number of sheets.

[Claim 6] The means to which is equipped with a means calculate the lapsed days from the last toner supply stage, and is equipped with a means calculate the days in which image formation is possible, based on these lapsed days, accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply urges is image-formation equipment according to claim 2 or 3 which it supposes that toner supply is urged when the period to the days in which image formation is possible becomes shorter than a predetermined period at a display means.

[Claim 7] The means to which toner supply is urged is image formation equipment according to claim 1 to which it is supposed that a toner residue is displayed on a display means.

[Claim 8] The means to which is equipped with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, and toner supply is urged is image formation equipment according to claim 1 to which it is supposed that this record material number of sheets is displayed on a display means.

[Claim 9] The means to which is equipped with a means to calculate the lapsed days from the last toner supply stage, and is equipped with a means to calculate the days in which image formation is possible, based on these lapsed days, accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged is image formation equipment according to claim 1 to which it is supposed that the days in which image formation is possible are displayed on a display means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the image formation equipment which has a means to calculate the amount of ** toners by the operation from a toner activity ratio.

[0002]

[Description of the Prior Art] Generally in image formation equipment, the toner sensor etc. is used for residue detection of a toner. When a toner sensor does not have a toner into a toner box, vibration is repeated by several kHz, and the toner is fully performing toner detection using vibration of a piezoelectric transducer stopping with the weight of a toner in a certain case.

[0003]

[Problem(s) to be Solved by the Invention] However, it was difficult to be unable to detect the residue of a toner but to predict a next toner supply stage beforehand until the toner became to some extent little by the above approaches.

[0004] The 1st invention concerning this application solves the above-mentioned trouble, and aims at offering the image formation equipment which can predict a next toner supply stage exactly.

[0005] Moreover, the 2nd invention concerning this application aims at offering the image formation equipment which can tell a user besides the above-mentioned purpose about a toner supply stage exactly.

[0006] Furthermore, the 3rd invention concerning this application aims at offering the image formation equipment which can report a toner supply stage certainly also in the image formation equipment connected with an external instrument like a printer besides the above-mentioned purpose.

[0007] Moreover, the 4th invention concerning this application aims at offering the image formation equipment to which the operating ratio of image formation equipment besides the above-mentioned purpose is not reduced.

[0008] Furthermore, the 5th invention concerning this application aims at offering the image formation equipment which image formation actuation does not interrupt with the lack of a toner to the middle, when performing continuous image formation actuation besides the above-mentioned purpose.

[0009] Moreover, the 6th invention concerning this application aims at offering the image formation equipment which can predict more concretely a toner supply stage besides the above-mentioned purpose.

[0010] Furthermore, the 7th invention concerning this application aims at offering the image formation equipment which can report intelligibly a toner supply stage besides the above-mentioned purpose.

[0011] Moreover, the 8th invention concerning this application aims at offering the image formation equipment which can report more intelligibly a toner supply stage besides the above-mentioned purpose.

[0012] Furthermore, the 9th invention concerning this application aims at offering the image formation equipment which can report more concretely a toner supply stage besides the above-mentioned purpose.

[0013]

[Means for Solving the Problem] According to the 1st invention concerning this application, the above-mentioned purpose In the image formation equipment which make a photo conductor front face expose based on image information, and form an electrostatic latent image, and develop this electrostatic latent image with the toner of a developer, and you make an image form, you make it record material imprinted and established, and is discharged An operation means to calculate the amount of the toner used based on each image information, and the means which carries out counting of the accumulation record material number of sheets from the last toner supply stage, the record material from the above-mentioned amount of the toner used, and accumulation record material number of sheets — it is attained by having a means to calculate a toner residue based on a means to calculate the toner activity ratio per sheet, and this toner activity ratio and the above-mentioned accumulation record material number of sheets, and a means to urge toner supply based on this toner residue.

[0014] Moreover, according to the 2nd invention concerning this application, a means to urge toner supply to the above-mentioned purpose in the 1st above-mentioned invention is attained by having a display means to perform an alarm display.

[0015] Furthermore, according to the 3rd invention concerning this application, a means to urge toner supply to the above-mentioned purpose in the 1st above-mentioned invention is attained by having the means of communications which communicates.

[0016] Moreover, according to the 4th invention concerning this application, a means to urge toner supply to the above-mentioned purpose in the 2nd above-mentioned invention or the 3rd invention is attained by urging toner supply, when a toner residue becomes less than the specified quantity.

[0017] Furthermore, according to the 5th invention concerning this application, the means to which the above-mentioned purpose equips with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, in the 2nd above-mentioned invention or the 3rd invention, and toner supply is urged is attained by urging toner supply, when this record material number of sheets becomes less than predetermined number of sheets.

[0018] According to the 6th invention concerning this application, moreover, the above-mentioned purpose In the 2nd above-mentioned invention or the 3rd invention, it has a means to calculate the lapsed days from the last toner supply stage. These lapsed days, The means to which is equipped with a means to calculate the days in which image formation is possible, based on accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged is attained by urging toner supply, when the period to the days in which image formation is possible becomes shorter than a predetermined period at a display means.

[0019] Furthermore, according to the 7th invention concerning this application, a means to urge toner supply to the above-mentioned purpose in the 1st above-mentioned invention is attained by displaying a toner residue on a display means.

[0020] Moreover, according to the 8th invention concerning this application, the means to which the above-mentioned purpose equips with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, in the 1st above-mentioned invention, and toner supply is urged is attained by displaying this record material number of sheets on a display means.

[0021] According to the 9th invention concerning this application, furthermore, the above-mentioned purpose In the 1st above-mentioned invention, it has a means to calculate the lapsed days from the last toner supply stage. These lapsed days, The means to which is equipped with a means to calculate the days in which image formation is possible, based on accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged is attained by displaying the days in which image formation is possible on a display means.

[0022]

[Function] According to the 1st invention concerning this application, the amount of the toner used is calculated based on each image information. Calculate the toner activity ratio per sheet and a toner residue is calculated based on this toner activity ratio and the above-mentioned accumulation record

material number of sheets. the record material from the above-mentioned amount of the toner used after carrying out counting of the accumulation record material number of sheets from the last toner supply stage, and accumulation record material number of sheets — Since toner supply is urged based on this toner residue, the supply stage of a toner is predicted exactly.

[0023] Moreover, according to the 2nd invention concerning this application, in the 1st above-mentioned invention, since the means to which toner supply is urged carries out an alarm display to a display means, a toner supply stage is exactly reported to a user.

[0024] Furthermore, according to the 3rd invention concerning this application, in the 1st above-mentioned invention, it reports that the means to which toner supply is urged communicates by means of communications, and has the need for toner supply to an external instrument.

[0025] Moreover, according to the 4th invention concerning this application, in the 2nd above-mentioned invention or the 3rd invention, since toner supply is urged when a toner residue becomes less than the specified quantity, the toner of the means to which toner supply is urged is not lost completely, and it does not reduce the operating ratio of equipment.

[0026] Furthermore, according to the 5th invention concerning this application, in the 2nd above-mentioned invention or the 3rd invention, since toner supply is urged to the means to which is equipped with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, and toner supply is urged when this record material number of sheets becomes less than predetermined number of sheets, the lack of a toner does not produce it in the middle of continuous image formation actuation.

[0027] Moreover, according to the 6th invention concerning this application, it sets to the 2nd above-mentioned invention or the 3rd invention. It has a means to calculate the lapsed days from the last toner supply stage. These lapsed days, The means to which is equipped with a means to calculate the days in which image formation is possible, based on accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged Since toner supply is urged when the period to the days in which image formation is possible becomes shorter than a predetermined period at a display means, a toner supply stage is reported more concretely.

[0028] furthermore, according to the 7th invention concerning this application, in the 1st above-mentioned invention, the means to which toner supply is urged displays a toner residue on a display means — coming out, a user recognizes the supply stage of a toner clearly.

[0029] Moreover, since the means to which is equipped with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio; in the 1st above-mentioned invention, and toner supply is urged displays this record material number of sheets on a display means according to the 8th invention concerning this application, a user recognizes a toner supply stage more exactly according to the record material number of sheets in which oneself tends to perform image formation.

[0030] Furthermore, according to the 9th invention concerning this application, it sets to the 1st above-mentioned invention. It has a means to calculate the lapsed days from the last toner supply stage. These lapsed days, Since the means to which is equipped with a means to calculate the days in which image formation is possible, based on accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged displays the days in which image formation is possible on a display means, a user recognizes the supply stage of a toner much more concretely.

[0031]

[Example] Hereafter, one example of this invention is explained based on an accompanying drawing.

Drawing 4 is the sectional view showing the structure of the image reproducing unit by one example of this invention. In drawing, 401 is a manuscript feeding device used as a manuscript feed means, and feeds every one sheet or two-sheet continuation with the laid manuscript in the predetermined location on the manuscript base glass side 402 with the directions of the development feed device control section 501 shown in drawing 5 . It will be a lamp 403 and the scanner which consists of scan mirror 405 grades, and if 404 is laid in the manuscript base glass side 402 by the manuscript feeding device 401, the both-way scan of the body is carried out in the predetermined direction, a lens 408 will be passed

through the scan mirror 405,406,407, the color will be separated with a RGB color-separation filter (not shown), and it will carry out image formation of the manuscript reflected light to the image-sensors section 409.

[0032] The picture signal inputted into the image-sensors section 409 outputs the analog picture signal by which the color of was separated with the RGB decomposition filter (not shown), and photo electric conversion was carried out by the image reader control section 502 shown in drawing 5 to the image control section 503.

[0033] Drawing 6 is the detail drawing of the picture signal control section 503. The analog picture signal changed into the electrical signal of RGB by the image reader control section 502 in drawing 6 is changed into a digital signal (this example 8 bits each) by A/D converter 601, and subsequently, after a shading compensation is performed by black amendment / white amendment section 602, each signal of RGB is inputted into ND signal generation section 603. In ND signal generation section 603, the signal of RGB is added, a division is done to one third, and it is a degree type and [0034].

[Equation 1] $Dout = (Rin + Gin + Bin) / 3$ [0035] It comes out, the luminance signal Dout expressed is outputted, and it is inputted into the image-processing section 604. And in the image-processing section 604, at the dot counter 605, image processings, such as variable power processing which expands / reduces an image, are performed, and counting of the number of the dots of each gradation (this example 4 bits) is carried out, and the amount of the toner used of a manuscript is measured, and after that, brightness-concentration conversion and concentration amendment by the printer are performed in the concentration amendment section 606, and it is sent to the printer control section 504 of a laser beam printer.

[0036] In addition, actuation of each above-mentioned control section is controlled in the gross in ***** by the control program memorized by this ROM506 of the CPU circuit section 505 which built in ROM506 and RAM507. Moreover, the control unit 508 is connected to this CPU circuit-section 505, and a setup in the mode required for image formation, the display by the control panel, etc. are performed in it.

[0037] And the signal inputted into the printer control section 504 as mentioned above is changed into a lightwave signal by the exposure control section 410 which consists of laser scanners shown in drawing 4, and is irradiated by the photo conductor 411 as a laser light based on image data.

[0038] 412 and 413 are developers and visualize the electrostatic latent image formed in the photo conductor 411 with the developer (toner) of a predetermined color. 414 and 415 are the transferred paper loading sections, the loading receipt of the transferred paper of the fixed form size as record material is carried out, and it is fed with them by the drive of a feed roller to a resist arrangement location, and where image tip doubling timing with the image formed in a photo conductor 411 is taken, paper is re-fed to them.

[0039] 416 is an imprint separation electrification machine, and after it imprints the toner image developed by the photo conductor 411 on transferred paper, it dissociates from a photo conductor 411 and is fixed to it in the fixing section 417 through a conveyance belt. 418 is a delivery roller and carries out the loading delivery of the transferred paper which image formation ended at a tray 420. 419 switches the conveyance direction of the transferred paper which image formation ended by the direction flapper in delivery opening and the direction of an internal conveyance way, and equips multiplex / double-sided image formation process with it.

[0040] The latent image made by exposure light on the photo conductor 411 is developed by the development counter 412 or the development counter 413. The above-mentioned latent-image timing is doubled, transferred paper is conveyed from the transferred paper loading section 414 or the transferred paper loading section 415, and the image by which development was carried out [above-mentioned] is imprinted in the imprint section 416. After transferred paper is fixed to the imprinted image in the fixing section 417, it is discharged by the equipment exterior from a delivery unit 418.

[0041] Moreover, transferred paper rotates the delivery unit roller 418 in the direction opposite to the delivery direction after passing the delivery sensor 419 at the time of double-sided record. Moreover, a flapper 421 is raised to this and coincidence up, and transferred paper [finishing / a copy] is stored in

the middle tray 424 through the conveyance ways 422 and 423. Next, paper is fed to the transferred paper stored in the middle tray 424 at the time of the rear-face record to perform, and an imprint on the back is performed at it.

[0042] Moreover, a flapper 421 is raised up at the time of multiplex record, and it stores transferred paper [finishing / a copy] in the middle tray 424 through the conveyance way of the conveyance ways 422 and 423. Next, the multiplex record to perform is fed with the transferred paper stored in the middle tray 424, and a multiplex imprint is performed.

[0043] In this example equipment, although an image is formed as mentioned above, in between each paper of image copy actuation, the patch by the toner image like 1cm around is formed on a photo conductor 411, and concentration adjustment is performed based on this patch. Hereafter, this concentration adjustment is explained.

[0044] Drawing 7 is some explanatory views of the image reproducing unit by this example. For a display and 702, as for a communication circuit and 704, Timer IC and 703 are [701 / a high-pressure control section and 705] controllers.

[0045] The laser light which emitted light from the laser unit 706 passes along a path 707,708,709, and is irradiated on a photo conductor 411.

[0046] Then, the concentration of this patch is measured by the patch concentration sensor 714, and when the concentration of this patch is lower than predetermined concentration, or in being high, it controls the high pressure of the primary electrification machine 710, a developer 412, and the imprint electrification machine 416 by the high-pressure control section 704.

[0047] Moreover, in this example, this controller 705 detects the exchange stage of a toner. Hereafter, based on drawing 1 thru/or drawing 3, detection processing of the exchange stage of the toner of this example is explained.

[0048] First, an injection of a power source performs data processing 1 which calculates the number of sheets and days of a toner in which a residue and a copy are possible (step 101).

[0049] This data processing 1 is obtained from the timer IC 702 which mentioned the time of a power up above first (step 201). This is used in order to calculate the lapsed days from the last toner supply time. In addition, since a switch 717 is reset in case it is exchanged in the toner cartridge 715 shown in drawing 7, this last toner supply time has memorized that time for the controller 705.

[0050] Next, the degree type from the amount of toners of the toner cartridge calculated to last time, and a toner activity ratio and accumulation copy number of sheets, [0051]

[Equation 2] (Toner residue) =(amount of toners of toner cartridge)-((toner activity ratio) x(accumulation copy number of sheets))

[0052] It is alike and a toner residue is calculated more (step 202).

[0053] this toner activity ratio and accumulation copy number of sheets — the last toner exchange stage detection processing — it is what was calculated by the data processing 2 (step 104) performed by being, and that calculated value is memorized by the controller 705.

[0054] This data processing 2 asks for and updates a toner activity ratio for every one copy actuation with the dot counter 605 of drawing 6 R> 6 from the accumulation copy number of sheets from the last toner supply stage which calculated the amount of the toner used which is the consumption of the toner consumed in one copy actuation (step 301), next was beforehand remembered to be this amount of the toner used as mentioned above, as shown in drawing 3 (step 302).

[0055]

[Equation 3] {(toner activity ratio before 1 turn) x(accumulation copy number of sheets)+ (the amount of the toner used)} /(accumulation copy number of sheets +1)

[0056] And accumulation copy number of sheets is incremented (step 303), and data processing 2 is ended.

[0057] Thus, after calculating the toner residue just behind powering on based on the last toner activity ratio and last accumulation copy number of sheets from a toner supply stage for which it asked next, the lapsed days from the last toner supply stage are calculated from the last toner supply stage and the current time acquired at step 201 as mentioned above (step 203). And the degree type from the lapsed

days for which carried out in this way and it asked, and the accumulation copy number of sheets to current [for which it asked by data processing 2 as mentioned above], [0058]

[Equation 4] (Accumulation copy number of sheets) / (lapsed days)

[0059] It is a degree type and [0060] by the present toner residue which was alike, calculated the copy number of sheets per day more (step 204), and was calculated as mentioned above, and the toner activity ratio by the present.

[Equation 5] (Toner residue) / (toner activity ratio)

[0061] It is alike and the number of sheets which can be copied is calculated more (step 205). That is, this number of sheets that can be copied points out the number of sheets which can copy until a toner disappears from this time completely.

[0062] Furthermore, the copy number of sheets per [which was mentioned above] day is used, and it is a degree type and [0063].

[Equation 5] (Toner residue) / (toner activity ratio) (x (copy number of sheets))

[0064] The days which can copy until it is alike and a toner disappears from this time completely more are calculated (step 206).

[0065] In addition, the toner residue calculated as mentioned above, a toner activity ratio, accumulation copy number of sheets, and the last toner supply stage are memorized by the memory of a controller 705, and these values are initialized, when it is exchanged in a toner cartridge 715 and a switch 717 is reset.

[0066] If pretreatment strokes (timing control of a process etc.) are performed (step 102), a copy carbon button is turned on, if the toner residue, the number of sheets which can be copied, and the days which can be copied to current are called for by data processing 1 as mentioned above, and copy actuation is started (step 103), data processing 2 mentioned above in order to update a toner activity ratio and accumulation copy number of sheets will be performed (step 104).

[0067] And after copy actuation is performed (step 105) and high-pressure control is performed (step 106), these processings are repeated till copy termination (steps 105-107).

[0068] Then, data processing 1 is performed again (step 108), the toner residue and the number-of-sheets list which can be copied after this copy actuation are asked for the days which can be copied, and it judges whether predetermined conditions are fulfilled (step 109).

[0069] There are few these predetermined conditions than default value with a toner residue. Or days until a toner is lost should just set up conditions, such as being fewer than default value. Notice processing is performed when this predetermined condition is fulfilled (step 110). This notice processing displays that there are few toners on the display 701 of drawing 7, or should just display the above-mentioned number of sheets which can be copied, the days which can be copied. A message may be similarly sent to addressing to a serviceman or a manager of a remote place through LAN or a public line from the communication circuit 703 of drawing 7.

[0070] Furthermore, although notified under predetermined conditions in this example, the value which did not fulfill predetermined conditions but asked also for ** by the regular above-mentioned operation may be displayed a toner residue, ** copy number of sheets, and next time in the form of the toner supply schedule moon (drawing 8 (a), (b), (c)) etc., or you may communicate.

[0071] Moreover, since it asks by the operation about the number of sheets which can be copied before a copy carbon button is pushed, when two or more copies exceeding the possible number of sheets tend to be performed, notice processing may be performed before copy actuation initiation.

[0072]

[Effect of the Invention] As explained above, according to the 1st invention concerning this application, the amount of the toner used is calculated based on each image information. Calculate the toner activity ratio per sheet and a toner residue is calculated based on this toner activity ratio and the above-mentioned accumulation record material number of sheets. the record material from the above-mentioned amount of the toner used after carrying out counting of the accumulation record material number of sheets from the last toner supply stage, and accumulation record material number of sheets - Since toner supply is urged based on this toner residue, the supply stage of a toner can be predicted

exactly.

[0073] Moreover, since the means to which toner supply is urged carries out an alarm display to a display means in the 1st above-mentioned invention according to the 2nd invention concerning this application, a user can know a toner supply stage exactly.

[0074] Furthermore, according to the 3rd invention concerning this application, in the 1st above-mentioned invention, it can report that the means to which toner supply is urged communicates by means of communications, and has the need for toner supply to an external instrument.

[0075] Moreover, according to the 4th invention concerning this application, in the 2nd above-mentioned invention or the 3rd invention, since toner supply is urged when a toner residue becomes less than the specified quantity, the toner of the means to which toner supply is urged is not lost completely, and it can prevent decline in the operating ratio of equipment.

[0076] Furthermore, according to the 5th invention concerning this application, in the 2nd above-mentioned invention or the 3rd invention, since toner supply is urged when this record material number of sheets becomes less than predetermined number of sheets, the means to which is equipped with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, and toner supply is urged can prevent generating with an insufficient toner in the middle of continuous image formation actuation.

[0077] Moreover, according to the 6th invention concerning this application, it sets to the 2nd above-mentioned invention or the 3rd invention. It has a means to calculate the lapsed days from the last toner supply stage. These lapsed days, The means to which is equipped with a means to calculate the days in which image formation is possible, based on accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged Since toner supply is urged when the period to the days in which image formation is possible becomes shorter than a predetermined period at a display means, a toner supply stage can be reported more concretely.

[0078] furthermore, according to the 7th invention concerning this application, in the 1st above-mentioned invention, the means to which toner supply is urged displays a toner residue on a display means — it can come out and a user can know the supply stage of a toner clearly.

[0079] Moreover, since the means to which is equipped with a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, in the 1st above-mentioned invention, and toner supply is urged displays this record material number of sheets on a display means according to the 8th invention concerning this application, a user can know a toner supply stage more exactly according to the record material number of sheets in which oneself tends to perform image formation.

[0080] Furthermore, according to the 9th invention concerning this application, it sets to the 1st above-mentioned invention. It has a means to calculate the lapsed days from the last toner supply stage. These lapsed days, Since the means to which is equipped with a means to calculate the days in which image formation is possible, based on accumulation record material number of sheets, a toner residue, and a toner activity ratio, and toner supply is urged displays the days in which image formation is possible on a display means, a user can know the supply stage of a toner much more concretely.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a flow chart explaining the image formation motion control in one example of this invention, and detection control of a toner exchange stage.

[Drawing 2] It is a flow chart explaining data processing of the toner residue in one example of this invention etc.

[Drawing 3] It is a flow chart explaining data processing of the toner activity ratio broken into one example of this invention etc.

[Drawing 4] It is the sectional view showing the configuration of the image formation equipment in one example of this invention.

[Drawing 5] It is a block diagram explaining the configuration of the controller section of one example of this invention.

[Drawing 6] It is the detail drawing of the picture signal control section of drawing 5 .

[Drawing 7] They are some explanatory views of image formation equipment.

[Drawing 8] It is drawing showing the example of a display of this example.

[Description of Notations]

411 Photo Conductor

412,413 Developer

605 Dot Counter (an Operation Means to Calculate the Amount of Toner Used Based on Each Image Information)

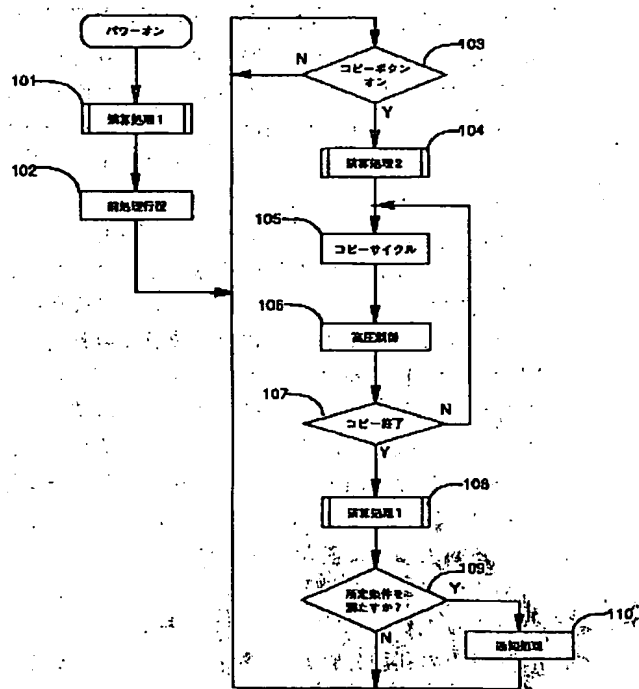
701 Display (Display Means)

703 Communication Circuit (Means of Communications)

705 Controller (Means Which Carries Out Counting of the Accumulation Record Material Number of Sheets from the Last Toner Supply Stage —) the record material from the amount of the toner used, and accumulation record material number of sheets — a means to calculate the toner activity ratio per sheet — A means to calculate a toner residue based on a toner activity ratio and accumulation record material number of sheets, The means to which toner supply is urged based on a toner residue, a means to calculate the record material number of sheets in which image formation is possible based on a toner residue and a toner activity ratio, a means to calculate the lapsed days from the last toner supply stage, and lapsed days, A means to calculate the days in which image formation is possible based on accumulation record material number of sheets, a toner residue, and a toner activity ratio

[Translation done.]

(11)特許出願公開番号:



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【特許請求の範囲】

【請求項1】 画像情報に基づいて感光体表面を露光せしめて静電潜像を形成し、現像装置のトナーにより該静電潜像を現像して画像を形成せしめ、記録材に転写・定着せしめて排出する画像形成装置において、トナー使用量を各画像情報に基づいて演算する演算手段と、前回のトナー補給時期からの累積記録材枚数を計数する手段と、上記トナー使用量と累積記録材枚数とから記録材一枚当たりのトナー使用率を演算する手段と、該トナー使用率と上記累積記録材枚数とに基づいてトナー残量を演算する手段と、該トナー残量に基づいてトナー補給を促す手段とを有する画像形成装置。

【請求項2】 トナー補給を促す手段は、警告表示を行う表示手段を有することとする請求項1に記載の画像形成装置。

【請求項3】 トナー補給を促す手段は、通信を行う通信手段を有することとする請求項1に記載の画像形成装置。

【請求項4】 トナー補給を促す手段は、トナー残量が所定量より少なくなった場合にトナー補給を促すこととする請求項2または請求項3に記載の画像形成装置。

【請求項5】 トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、該記録材枚数が所定枚数よりも少なくなった場合にトナー補給を促すこととする請求項2または請求項3に記載の画像形成装置。

【請求項6】 前回のトナー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数までの期間が所定期間よりも短くなった場合にトナー補給を促すこととする請求項2または請求項3に記載の画像形成装置。

【請求項7】 トナー補給を促す手段は、表示手段にトナー残量を表示することとする請求項1に記載の画像形成装置。

【請求項8】 トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、表示手段に該記録材枚数を表示することとする請求項1に記載の画像形成装置。

【請求項9】 前回のトナー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数を表示することとする請求項1に記載の画像形成装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、残トナー量をトナー使用率から演算で求める手段を有する画像形成装置に関す

る。

【0002】

【従来の技術】 一般に画像形成装置においてトナーの残量検知にはトナーセンサ等が使用されている。トナーセンサはトナーボックス内にトナーがない場合には、数KHzで振動を繰り返す、トナーが十分にある場合には、トナーの重みにより圧電振動子の振動が止まることを利用してトナー検知を行っている。

【0003】

【発明が解決しようとしている課題】 しかしながら、上述のような方法では、トナーがある程度少量になるまでは、トナーの残量を検知することができず、予め、次のトナー補給時期を予測することが難しかった。

【0004】 本出願に係る第1の発明は、上記問題を解決し、次のトナー補給時期を的確に予測することのできる画像形成装置を提供することを目的としている。

【0005】 また、本出願に係る第2の発明は、上記目的の他、ユーザーにトナー補給時期を的確に知らせることのできる画像形成装置を提供することを目的としている。

【0006】 さらに、本出願に係る第3の発明は、上記目的の他、プリンター等のように外部機器と接続される画像形成装置においても、確実にトナー補給時期を報知することのできる画像形成装置を提供することを目的としている。

【0007】 また、本出願に係る第4の発明は、上記目的の他、画像形成装置の稼働率を低下させることのない画像形成装置を提供することを目的としている。

【0008】 さらに、本出願に係る第5の発明は、上記目的の他、連続的な画像形成動作を行う場合に、その途中においてトナー不足により画像形成動作が中断することのない画像形成装置を提供することを目的としている。

【0009】 また、本出願に係る第6の発明は、上記目的の他、トナー補給時期をより具体的に予測することのできる画像形成装置を提供することを目的としている。

【0010】 さらに、本出願に係る第7の発明は、上記目的の他、トナー補給時期を分かり易く報知することのできる画像形成装置を提供することを目的としている。

【0011】 また、本出願に係る第8の発明は、上記目的の他、トナー補給時期をより分かり易く報知することのできる画像形成装置を提供することを目的としている。

【0012】 さらに、本出願に係る第9の発明は、上記目的の他、トナー補給時期をより具体的に報知することのできる画像形成装置を提供することを目的としている。

【0013】

【課題を解決するための手段】 本出願に係る第1の発明によれば、上記目的は、画像情報に基づいて感光体表面

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を露光せしめて静電潜像を形成し、現像装置のトナーにより該静電潜像を現像して画像を形成せしめ、記録材に転写・定着せしめて排出する画像形成装置において、トナー使用量を各画像情報に基づいて演算する演算手段と、前回のトナー補給時期からの累積記録材枚数を計数する手段と、上記トナー使用量と累積記録材枚数とから記録材一枚当たりのトナー使用率を演算する手段と、該トナー使用率と上記累積記録材枚数とに基づいてトナー残量を演算する手段と、該トナー残量に基づいてトナー補給を促す手段とを有することにより達成される。

【0014】また、本出願に係る第2の発明によれば、上記目的は、上記第1の発明において、トナー補給を促す手段は、警告表示を行う表示手段を有することにより達成される。

【0015】さらに、本出願に係る第3の発明によれば、上記目的は、上記第1の発明において、トナー補給を促す手段は、通信を行う通信手段を有することにより達成される。

【0016】また、本出願に係る第4の発明によれば、上記目的は、上記第2の発明または第3の発明において、トナー補給を促す手段は、トナー残量が所定量より少なくなった場合にトナー補給を促すことにより達成される。

【0017】さらに、本出願に係る第5の発明によれば、上記目的は、上記第2の発明または第3の発明において、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、該記録材枚数が所定枚数よりも少なくなった場合にトナー補給を促すことにより達成される。

【0018】また、本出願に係る第6の発明によれば、上記目的は、上記第2の発明または第3の発明において、前回のトナー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数までの期間が所定期間よりも短くなった場合にトナー補給を促すことにより達成される。

【0019】さらに、本出願に係る第7の発明によれば、上記目的は、上記第1の発明において、トナー補給を促す手段は、表示手段にトナー残量を表示することにより達成される。

【0020】また、本出願に係る第8の発明によれば、上記目的は、上記第1の発明において、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、表示手段に該記録材枚数を表示することにより達成される。

【0021】さらに、本出願に係る第9の発明によれば、上記目的は、上記第1の発明において、前回のトナー補給時期からの経過日数を演算する手段を備え、該経

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過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数を表示することにより達成される。

【0022】

【作用】本出願に係る第1の発明によれば、トナー使用量を各画像情報に基づいて演算し、前回のトナー補給時期からの累積記録材枚数を計数した後、上記トナー使用量と累積記録材枚数とから記録材一枚当たりのトナー使用率を演算し、該トナー使用率と上記累積記録材枚数とに基づいてトナー残量を演算して、該トナー残量に基づいてトナー補給を促すので、トナーの補給時期を的確に予測する。

【0023】また、本出願に係る第2の発明によれば、上記第1の発明において、トナー補給を促す手段は、表示手段に警告表示を行うので、トナー補給時期が的確にユーザーに報知される。

【0024】さらに、本出願に係る第3の発明によれば、上記第1の発明において、トナー補給を促す手段は、通信手段により通信を行い、外部機器に対してトナー補給の必要があることを報知する。

【0025】また、本出願に係る第4の発明によれば、上記第2の発明または第3の発明において、トナー補給を促す手段は、トナー残量が所定量より少なくなった場合にトナー補給を促すので、トナーが完全に無くなることなく、装置の稼働率を低下させない。

【0026】さらに、本出願に係る第5の発明によれば、上記第2の発明または第3の発明において、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、該記録材枚数が所定枚数よりも少なくなった場合にトナー補給を促すので、連続的な画像形成動作の途中にトナー不足が生じることがない。

【0027】また、本出願に係る第6の発明によれば、上記第2の発明または第3の発明において、前回のトナー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数までの期間が所定期間よりも短くなった場合にトナー補給を促すので、トナー補給時期がより具体的に報知される。

【0028】さらに、本出願に係る第7の発明によれば、上記第1の発明において、トナー補給を促す手段は、表示手段にトナー残量を表示するで、ユーザーはトナーの補給時期を明確に認知する。

【0029】また、本出願に係る第8の発明によれば、上記第1の発明において、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、表示手段に該記録材枚数

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を表示するので、ユーザーは自らが画像形成を行おうとする記録材枚数に応じて、よりの確にトナー補給時期を認知する。

【0030】さらに、本出願に係る第9の発明によれば、上記第1の発明において、前回のトナー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数を表示するので、ユーザーはより一層具体的にトナーの補給時期を認知する。

【0031】

【実施例】以下、本発明の一実施例を添付図面に基づいて説明する。図4は、本発明の一実施例による画像複写装置の構造を示す断面図である。図において、401は原稿給送手段となる原稿給送装置で、図5に示す現像給送装置制御部501の指示により、載置された原稿を1枚ずつ、あるいは2枚連続に原稿台ガラス面402上の所定位置に給送する。404はランプ403、走査ミラー405等で構成されるスキャナーで、原稿給送装置401により原稿台ガラス面402に載置されると、本体が所定方向に往復走査されて原稿反射光を走査ミラー405、406、407を介してレンズ408を通過して、RGB色分解フィルタ（図示せず）により色分解されてイメージセンサ部409に結像する。

【0032】イメージセンサ部409に入力された画像信号は、図5に示すイメージリーダ制御部502にて、RGB色分解フィルタ（図示せず）により色分解され光電変換されたアナログ画像信号を画像制御部503に出力する。

【0033】図6は画像信号制御部503の詳細図である。図6においてイメージリーダ制御部502によりRGBの電気信号に変換されたアナログ画像信号はA/D変換器601によりデジタル信号（本実施例では各8ビット）に変換され、次いで、黒補正／白補正部602によりシェーディング補正が施された後、ND信号生成部603にRGBの各信号が入力される。ND信号生成部603では、RGBの信号が加算され、1/3に除算されて、次式、

【0034】

【数1】 $D_{out} = (R_{in} + G_{in} + B_{in}) / 3$

【0035】で表される輝度信号 D_{out} が出力され、画像処理部604に入力される。そして、画像処理部604では、画像を拡大／縮小する変倍処理等の画像処理が行われ、ドットカウンタ605では、各階調（本実施例では4ビット）のドットの数を計数し、原稿のトナー使用量を計測し、その後、濃度補正部606で輝度－濃度変換、プリンターでの濃度補正が行われてレーザープリンターのプリンター制御部504に送られる。

【0036】尚、上記各制御部の動作は、ROM50

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6、RAM507を内蔵したCPU回路部505の該ROM506に記憶された制御プログラムに基づいてを総括的に制御される。また、このCPU回路部505には、操作部508が接続されており、画像形成に必要なモードの設定、操作パネルによる表示等が行われる。

【0037】そして、以上のようにしてプリンタ制御部504に入力された信号は、図4に示すレーザスキャナーで構成される露光制御部410にて光信号に変換され、画像データに基づくレーザー光として感光体411に照射される。

【0038】412、413は現像装置で、感光体411に形成された静電潜像を所定色の現像剤（トナー）で可視化する。414、415は被転写紙積載部で、記録材としての定形サイズの被転写紙が積載収納され、給送ローラの駆動によりレジスト配設位置まで給送され、感光体411に形成される画像との画像先端合わせタイミングをとられた状態で再給紙される。

【0039】416は転写分離帯電器で、感光体411に現像されたトナー像を被転写紙に転写した後、感光体411より分離して搬送ベルトを介して定着部417で定着される。418は排紙ローラで、画像形成の終了した被転写紙をトレイ420に積載排紙する。419は方向フラッパーで画像形成の終了した被転写紙の搬送方向を排紙口と内部搬送路方向に切り換え、多重／両面画像形成プロセスに備える。

【0040】照射光によって感光体411上に作られた潜像は現像器412もしくは現像器413によって現像される。上記潜像タイミングを合わせて被転写紙積載部414もしくは被転写紙積載部415より被転写紙が搬送され、転写部416において、上記現像された像が転写される。転写された像は、定着部417にて被転写紙に定着された後、排紙部418より装置外部に排出される。

【0041】また、両面記録時は、被転写紙が排紙センサ419を通過後、排紙部ローラ418を排紙方向と反対の方向に回転させる。また、これと同時にフラッパー421を上方に上げて複写済みの被転写紙を搬送路422、423を介して中間トレイ424に格納する。次に行う裏面記録時に中間トレイ424に格納されている被転写紙が給紙され、裏面の転写が行われる。

【0042】また、多重記録時は、フラッパー421を上方に上げて複写済みの被転写紙を搬送路422、423の搬送路を介して中間トレイ424に格納する。次に行う多重記録に中間トレイ424に格納されている被転写紙が給送され、多重転写が行われる。

【0043】本実施例装置においては、以上のように画像が形成されるが、画像複写動作の各紙間において、感光体411上に1センチ四方程のトナー画像によるパッチを形成し、このパッチに基づいて濃度調整を行うようになっている。以下、この濃度調整について説明する。

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【0044】図7は本実施例による画像複写装置の一部の説明図である。701は表示部、702はタイマーIC、703は通信回路、704は高圧制御部、705はコントローラである。

【0045】レーザユニット706から発光されたレーザ光は経路707、708、709を通して、感光体411上に照射される。

【0046】その後、パッチ濃度センサ714でこのパッチの濃度を計測し、このパッチの濃度が所定の濃度よりも低い場合や高い場合には高圧制御部704で1次帯電器710、現像装置412、転写帯電器416の高圧を制御する。

【0047】また、本実施例では、このコントローラ705により、トナーの交換時期を検出するようになっている。以下、図1ないし図3に基づいて本実施例のトナーの交換時期の検出処理について説明する。

【0048】まず、電源が投入されると、トナーの残量とコピー可能な枚数及び日数を演算する演算処理1が行われる(ステップ101)。

【0049】この演算処理1は、最初に電源投入時の日時を上記したタイマーIC702から得る(ステップ201)。これは、前回のトナー補給日時からの経過日数を演算するために用いるものである。なお、この前回のトナー補給日時は、図7に示すトナーカートリッジ715が交換される際にスイッチ717がリセットされるため、その日時をコントローラ705に記憶している。

【0050】次に、前回は演算したトナーカートリッジのトナー量と、トナー使用率、累積コピー枚数とから、次式、

【0051】

【数2】(トナー残量) = (トナーカートリッジのトナー量) - { (トナー使用率) × (累積コピー枚数) }

【0052】によりトナー残量を演算する(ステップ202)。

【0053】このトナー使用率と累積コピー枚数は、前回のトナー交換時期検出処理において行った演算処理2(ステップ104)にて演算したもので、その演算した値がコントローラ705に記憶されている。

【0054】この演算処理2は、図3に示すように、図6のドットカウンタ605により、一回のコピー動作で消費するトナーの消費量であるトナー使用量を求め(ステップ301)、次に、このトナー使用量と、上述のように予め記憶しておいた前回のトナー補給時期からの累積コピー枚数とから、一回のコピー動作毎にトナー使用率を求め、更新する(ステップ302)。

【0055】

【数3】{ (1ターン前のトナー使用率) × (累積コピー枚数) + (トナー使用量) } / (累積コピー枚数 + 1)

【0056】そして、累積コピー枚数をインクリメント

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して(ステップ303)、演算処理2を終了する。

【0057】このようにして求めた前回のトナー補給時期からのトナー使用率と累積コピー枚数に基づいて、電源投入直後のトナー残量を求めた後、次に、前回のトナー補給時期と上述のようにステップ201で得た現在の日時とから、前回のトナー補給時期からの経過日数を演算する(ステップ203)。そして、このようにして求めた経過日数と、上述のように演算処理2で求めた現在までの累積コピー枚数とから、次式、

【0058】

【数4】(累積コピー枚数) / (経過日数)

【0059】により、一日当たりのコピー枚数を演算し(ステップ204)、上述のように求めた現在のトナー残量と、現在までのトナー使用率とにより、次式、

【0060】

【数5】(トナー残量) / (トナー使用率)

【0061】により、コピー可能枚数を演算する(ステップ205)。つまり、このコピー可能枚数とは、現時点からトナーが完全に無くなるまでのコピー可能な枚数を指すものである。

【0062】さらに、上述した一日当たりのコピー枚数を用いて、次式、

【0063】

【数5】(トナー残量) / { (トナー使用率) × (コピー枚数) }

【0064】により、現時点からトナーが完全に無くなるまでのコピー可能な日数を演算する(ステップ206)。

【0065】なお、以上のようにして求めた、トナー残量、トナー使用率、累積コピー枚数、前回のトナー補給時期は、コントローラ705のメモリに記憶され、トナーカートリッジ715が交換されてスイッチ717がリセットされたときに、これらの値は初期化される。

【0066】以上のようにして、演算処理1により、現在までのトナー残量とコピー可能枚数とコピー可能日数が求められると、前処理行程(プロセスのタイミング制御等)が行われ(ステップ102)、コピーボタンがオンされて、コピー動作が開始されると(ステップ103)、トナー使用率と累積コピー枚数を更新するために上述した演算処理2が行われる(ステップ104)。

【0067】そして、コピー動作が行われ(ステップ105)、高圧制御が行われた後(ステップ106)、これらの処理をコピー終了まで繰り返す(ステップ105~107)。

【0068】この後、再び演算処理1を行い(ステップ108)、今回のコピー動作後におけるトナー残量及びコピー可能枚数並びにコピー可能日数を求め、所定条件が満たされているかどうかを判断する(ステップ109)。

【0069】この所定条件とは、トナー残量がある規定

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値より少ない。あるいはトナーが無くなるまでの日数が規定値より少ない等の条件を設定すればよい。この所定条件が満たされた場合には通知処理を行う（ステップ110）。この通知処理は図7の表示部701にトナーが少ないことを表示したり、上述のコピー可能枚数、コピー可能日数等を表示すればよい。同様に図7の通信回路703よりLANあるいは公衆回線等を通じて遠隔地のサービスマンや管理者あてにメッセージを送ってもよい。

【0070】さらに、本実施例では所定条件のもとで通知を行っているが、所定条件を満たさずとも常時上述の演算で求めた値をトナー残量、残コピー枚数、次回トナー補給予定月等の形式（図8（a）、（b）、（c））で表示したり、通信を行ってもよい。

【0071】また、コピー可能枚数に関しては、コピーボタンが押下される前に演算により求められているので、その可能枚数を超える複数枚のコピーが行われようとする場合に、コピー動作開始前に通知処理を行っても良い。

【0072】

【発明の効果】以上説明したように、本出願に係る第1の発明によれば、トナー使用量を各画像情報に基づいて演算し、前回のトナー補給時期からの累積記録材枚数を計数した後、上記トナー使用量と累積記録材枚数とから記録材一枚当たりのトナー使用率を演算し、該トナー使用率と上記累積記録材枚数とに基づいてトナー残量を演算して、該トナー残量に基づいてトナー補給を促すので、トナーの補給時期を的確に予測することができる。

【0073】また、本出願に係る第2の発明によれば、上記第1の発明において、トナー補給を促す手段は、表示手段に警告表示を行うので、ユーザーはトナー補給時期を的確に知ることができる。

【0074】さらに、本出願に係る第3の発明によれば、上記第1の発明において、トナー補給を促す手段は、通信手段により通信を行い、外部機器に対してトナー補給の必要があることを報知することができる。

【0075】また、本出願に係る第4の発明によれば、上記第2の発明または第3の発明において、トナー補給を促す手段は、トナー残量が所定量より少なくなった場合にトナー補給を促すので、トナーが完全に無くなることなく、装置の稼働率の低下を防ぐことができる。

【0076】さらに、本出願に係る第5の発明によれば、上記第2の発明または第3の発明において、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、該記録材枚数が所定枚数よりも少なくなった場合にトナー補給を促すので、連続的な画像形成動作の途中におけるトナー不足の発生を防ぐことができる。

【0077】また、本出願に係る第6の発明によれば、上記第2の発明または第3の発明において、前回のトナ

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ー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数までの期間が所定期間よりも短くなった場合にトナー補給を促すので、トナー補給時期をより具体的に報知することができる。

【0078】さらに、本出願に係る第7の発明によれば、上記第1の発明において、トナー補給を促す手段は、表示手段にトナー残量を表示するで、ユーザーはトナーの補給時期を明確に知ることができる。

【0079】また、本出願に係る第8の発明によれば、上記第1の発明において、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段を備え、トナー補給を促す手段は、表示手段に該記録材枚数を表示するので、ユーザーは自らが画像形成を行おうとする記録材枚数に応じて、よりの確にトナー補給時期を知ることができる。

【0080】さらに、本出願に係る第9の発明によれば、上記第1の発明において、前回のトナー補給時期からの経過日数を演算する手段を備え、該経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段を備え、トナー補給を促す手段は、表示手段に画像形成可能な日数を表示するので、ユーザーはより一層具体的にトナーの補給時期を知ることができる。

【図面の簡単な説明】

【図1】本発明の一実施例における画像形成動作制御及びトナー交換時期の検出制御を説明する流れ図である。

【図2】本発明の一実施例におけるトナー残量の演算処理等を説明する流れ図である。

【図3】本発明の一実施例におけるトナー使用率の演算処理等を説明する流れ図である。

【図4】本発明の一実施例における画像形成装置の構成を示す断面図である。

【図5】本発明の一実施例のコントローラ部の構成を説明するブロック図である。

【図6】図5の画像信号制御部の詳細図である。

【図7】画像形成装置の一部の説明図である。

【図8】本実施例の表示の例を示す図である。

【符号の説明】

411 感光体

412, 413 現像装置

605 ドットカウンタ（トナー使用量を各画像情報に基づいて演算する演算手段）

701 表示部（表示手段）

703 通信回路（通信手段）

705 コントローラ（前回のトナー補給時期からの累積記録材枚数を計数する手段、トナー使用量と累積記録材枚数とから記録材一枚当たりのトナー使用率を演算す

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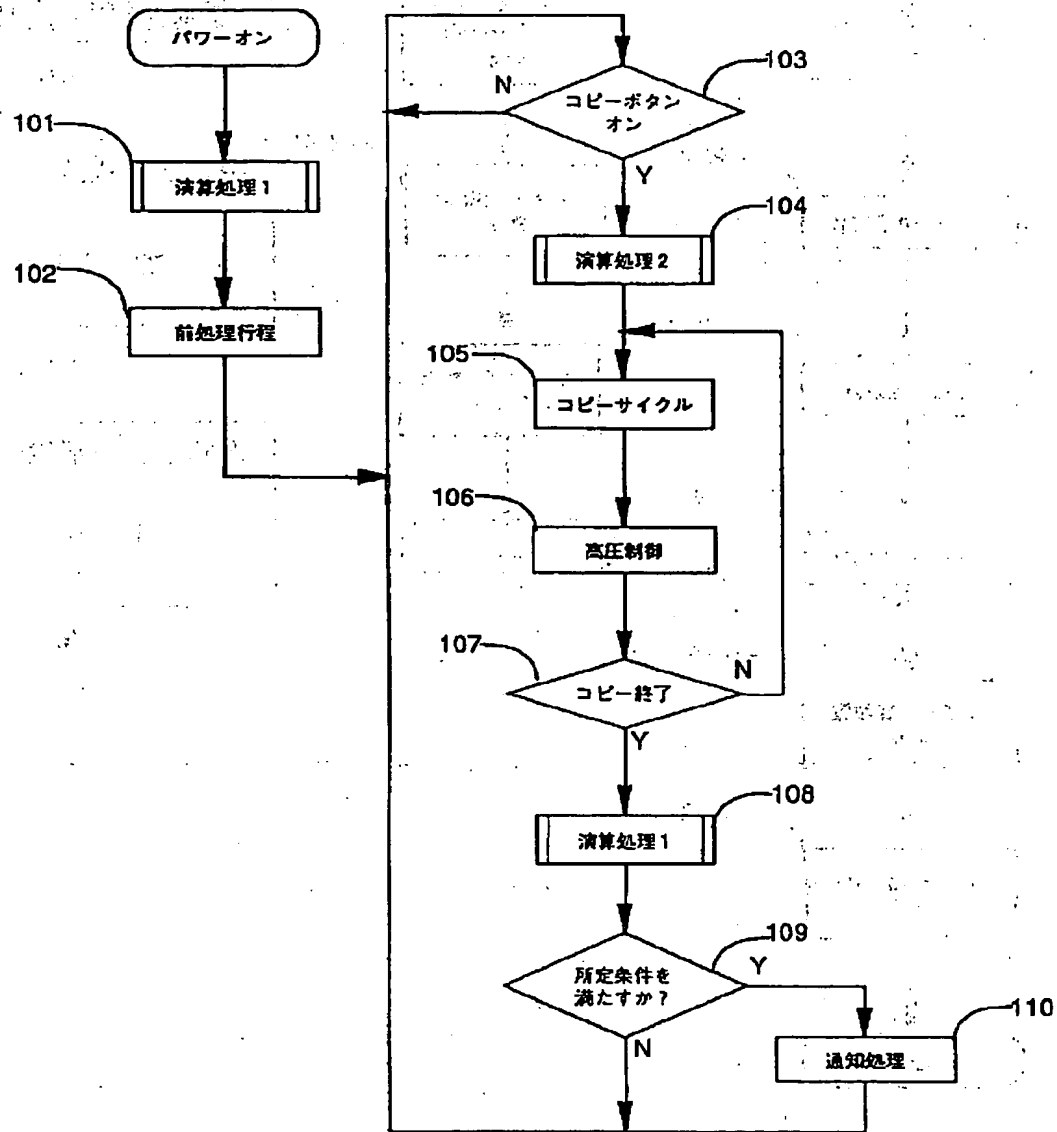
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る手段、トナー使用率と累積記録材枚数とに基づいてトナー残量を演算する手段、トナー残量に基づいてトナー補給を促す手段、トナー残量とトナー使用率に基づいて画像形成可能な記録材枚数を演算する手段、前回のトナ

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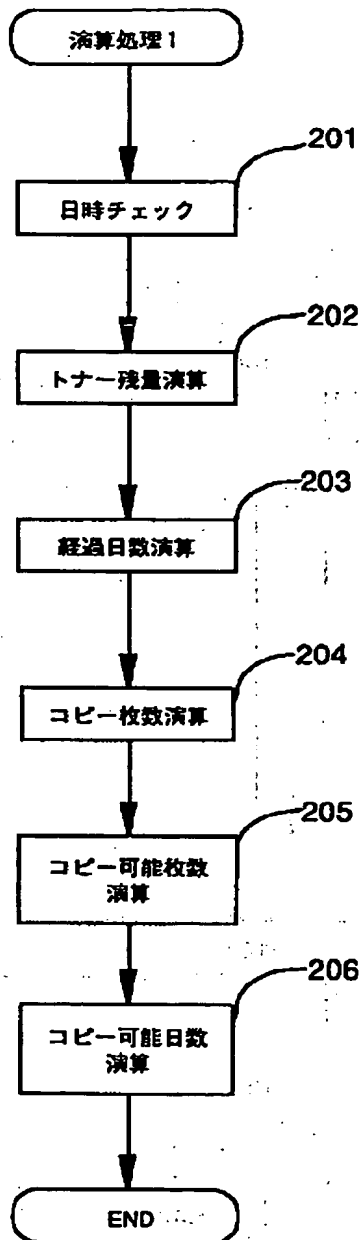
一補給時期からの経過日数を演算する手段、経過日数と、累積記録材枚数と、トナー残量と、トナー使用率とに基づいて、画像形成可能な日数を演算する手段)

【図1】

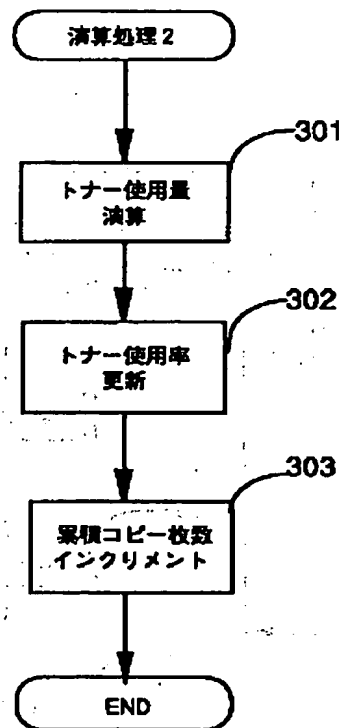


(8)

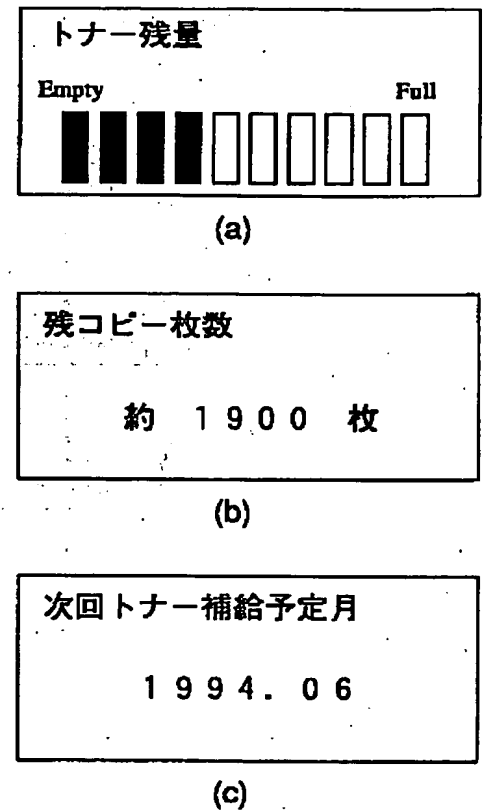
【図2】



【図3】

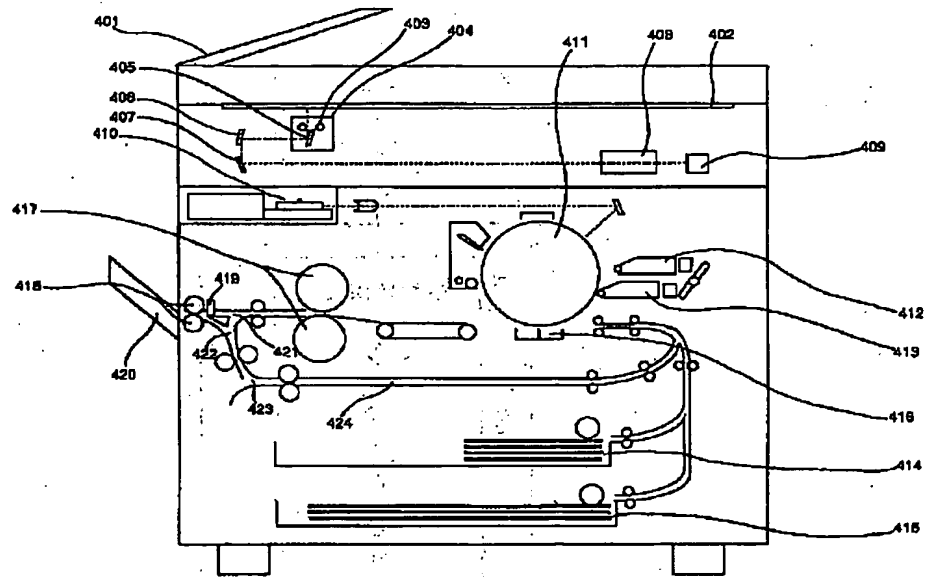


【図8】

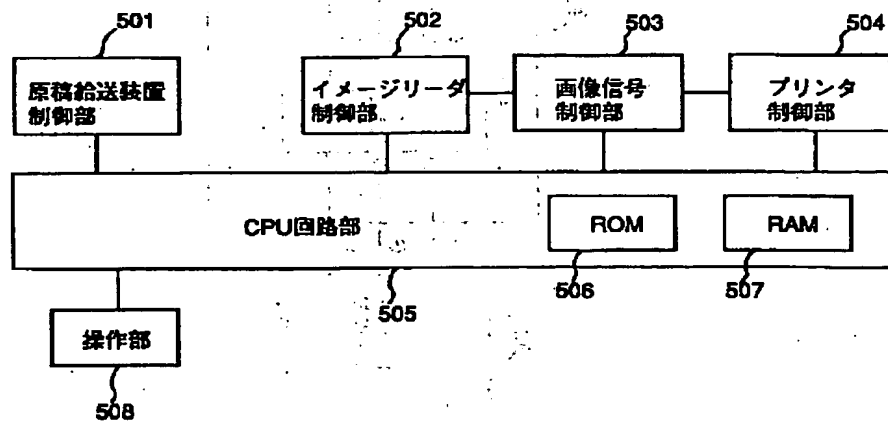


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【図4】

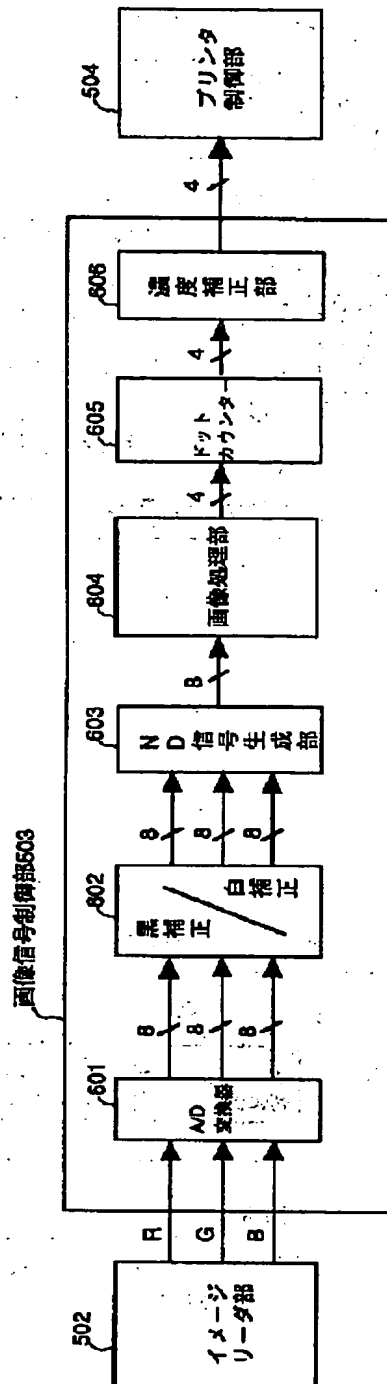


【図5】



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【図6】



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【図7】

